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EXTERNAL ELECTRONIC DEVICE

FIELD OF THE INVENTION

The present invention pertains to an external electronic device used for connection to an electronic device such as a personal computer, portable telephone, etc.

BACKGROUND OF THE INVENTION

Various types of external electronic devices can be connected to an electronic device such as a personal computer, portable telephone, etc. by wires or wirelessly, making it possible to utilize various functions provided by the connected external electronic device. For example, the wired type of external electronic device has an electronic device main body with a control board, etc., installed therein, an operating unit, and a connection terminal that can be inserted into an socket formed in the electronic device to be connected, such as a personal computer, portable telephone, etc. The external electronic device can be connected to the connected electronic device by inserting the external electronic device's connection terminal into the socket of the electronic device to be connected. In this state, the electronic device to be connected is able to utilize various functions provided by the external electronic device.

Now, the connection socket provided in the electronic device to be connected generally differs in position and orientation according to the type of electronic device to be connected. Therefore, when the connection terminal is inserted in the connection socket, the external electronic device is connected facing upward, facing downward, horizontally, etc. according to the position of the socket. Also, the external electronic device's operating unit changes to be upward, lateral, downward, etc. according to the orientation of the connection socket. Therefore, depending on the orientation or position of the external electronic device when connected, the operating unit may not be operable, or may be difficult to operate.

For example, if an external electronic device that has a fingerprint sensor is inserted and fixed in the USB connection port of a personal computer, if the detection face of the fingerprint sensor disposed at that operating unit is oriented downward, it is difficult to place a fingertip on the detection face for fingerprint reading. Also, in this case the operating keys aligned with the operating face cannot be viewed, so operating them is difficult too.

SUMMARY OF THE INVENTION

The present invention is directed to providing an external electronic device whose operating unit can be disposed at a position or orientation where it is easy to operate regardless of the position or orientation of a connection socket provided in an electronic device to be connected, such as a personal computer, portable telephone, etc.

In order to achieve this goal, the present invention's external electronic device is characterized as comprising:

An electronic device main body,

A connection terminal for connecting the electronic device main body to an electronic device to be connected, such as a personal computer, portable telephone, etc., and

An operating unit formed in the electronic device main body;

The operating unit is attached so that it can rotate vis-à-vis the electronic device main body.

In the present invention's external electronic device the operating unit is attached so it can rotate vis-à-vis the electronic device main body. Therefore the operating unit can be rotated when the connection terminal is inserted in the connection socket of the electronic device to be connected, so the operating unit can be disposed at an easy to operate location regardless of the position or orientation of the electronic device main body.

Here, when the operating unit is coaxially attached vis-à-vis the electronic device main body, the operating unit should be attached to the electronic device main body so that it can rotate centered on the center axis of the electronic device main body.

Next, when a fingerprint sensor is installed in the electronic device main body, when the detection face of the fingerprint sensor is disposed at the operating unit, if the detection face is facing downward or sideways when connected to the electronic device that is to be connected, the detection face can be changed to facing upward by rotating the operating unit. When it faces upward, placing a fingertip on the detection face becomes easy.

Meanwhile, it is also possible to have a constitution that provides a switching means for switching on or off when the operating unit is rotated. If constituted in this manner, it is possible to interrupt the circuit and start/stop circuit functions such as file transfer, etc. in a way that is linked to rotating the operating unit. In this case it may also be constituted so that when a predetermined time elapses after switching on or off it switches off or on.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is an oblique view showing a fingerprint authentication device using the present invention.

FIGURES 2(a) and (b) are diagrams explaining the operation of inserting the fingerprint authentication device of FIGURE 1 into the USB socket of a personal computer, which is the electronic device to be connected.

FIGURE 3 is a flowchart showing the operation of the fingerprint authentication device of FIGURE 1 and the operation of a personal computer into which the fingerprint authentication device is inserted.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

An embodiment of an external electronic device employing the present invention is explained below with reference to the drawings. Furthermore, the present invention is not limited to the following embodiment; it can be employed in various types of external electronic devices within the scope of the claims, of course.

FIGURE 1 is an oblique view showing a fingerprint authentication device that is an embodiment of an external electronic device using the present invention. The fingerprint authentication device 1 of this example is connected to the USB socket of the electronic device to be connected (a personal computer, for example) and authenticates the user by checking fingerprints.

This example's fingerprint authentication device 1 includes a columnar electronic device main body 2, a columnar rotary-type operating unit 3 attached coaxially to the back end of the electronic device main body 2, and a USB terminal 4 projecting forward from the front end face 2a of the electronic device main body 2. The rotary-type operating unit 3 is attached to the electronic device main body 2 so that it can rotate centered on the center axis 1a of the external

electronic device 1. Also, an opening 5 is formed in the outer peripheral face of the rotary-type operating unit 3; the bottom portion of the opening 5 is a rectangular fingertip placing surface 6 (detection face).

The electronic device main body 2 has a built-in control circuit 7, fingerprint sensor 8, switching circuit 9, memory 10, etc. When the rotary-type operating unit 3 is rotated, the control circuit 7 is turned on by the switching circuit 9, the fingerprint authentication device 1 starts, and can read a fingerprint with the fingerprint sensor 8 under the control of the control circuit 7. When a fingertip is placed on the fingertip placing surface 6, the fingerprint is read by the fingerprint sensor 8, and the read fingerprint is checked against a fingerprint registered in the memory 10. The user is authenticated by comparing fingerprints.

Referring to FIGURE 2, we shall explain the operation of the rotary-type operating unit 3 in the fingerprint authentication device 1 of this example. First, as shown in FIGURE 2(a), when connecting the fingerprint authentication device 1 to a personal computer 5 in which the USB socket 51 is horizontally disposed, the fingertip placing surface 6 faces upward. In this case, as shown in FIGURE 2(b), when inserting the fingerprint authentication device 1 in a personal computer 5A in which the USB socket 51 is vertically disposed, the fingertip placing surface 6 faces sideways. Therefore, if the rotary-type operating unit 3 is rotated 90 degrees centered on the center axis 1a, the fingertip placing surface 6 can be made to face upward.

Therefore, in this example's fingerprint authentication device 1, even if the USB socket 51 of the electronic device to be connected faces in any direction, the fingertip placing surface 6 can always be changed to an easy to use orientation by rotating the rotary-type operating unit 3. Therefore the fingertip can easily be placed on the fingertip placing surface 6.

Next, an example of the operation of the fingertip [sic] authentication device 1 shall be explained with reference to FIGURE 1. First, the power source of the personal computer 5 that is the electronic device to be connected is turned on, and the fingerprint authentication device 1 is connected to the personal computer 5 (procedure ST1, 2).

Next, the rotary-type operating unit 3 of the fingerprint authentication device 1 is rotated to a location where it is easy to place a fingertip on the fingertip placing surface 6. When the rotary-type operating unit 3 is rotated, the power source is switched on by the switching circuit and the fingerprint authentication device 1 starts (procedure ST3, 4). Furthermore, if the fingertip placing surface 6 is already oriented so that it is easy to place a fingertip when the fingerprint authentication device 1 is connected to the personal computer 5, the rotary-type operating unit 3 is rotated once and returned to the original location and the fingerprint authentication device 1 starts.

In this example, when the rotary-type operating unit 3 is rotated, it switches to an electrically conductive state for just a fixed time; after the fixed time elapses it automatically turns off, and the fingerprint authentication device 1 turns off (procedure ST5).

The fingerprint authentication device 1, started in this manner, reads a fingertip placed on the fingertip placing surface 6 (procedure ST11, 12) and authenticates the user (procedure ST13). If the user is not authenticated, communication with the personal computer 6 is forcibly ended (procedure ST14).

Meanwhile, at the side of the personal computer 5 that is the electronic device to be connected to, the connected device is recognized (procedure ST21), electronic certificate exchange occurs (procedure ST22), and if the device is not authenticated the authentication process ends (procedure ST23). If the device is authenticated, the user ID is requested (procedure ST24).

At the side of the fingerprint authentication device 1, if device authentication fails and the user ID is not requested, the connection with the personal computer 5 is forcibly interrupted (procedure ST15, 16). If a user ID request is received from the personal computer 5 (procedure ST15), the user ID is sent to the personal computer 5 (procedure ST17) and the connection with the personal computer 5 is broken (procedure ST18).

At the personal computer 5 side, when the user ID is received (procedure ST25) the user environment information corresponding to the user ID is retrieved from memory and the user environment is restored in the personal computer 5 (procedure ST26). As a result, the user authenticated by the fingerprint authentication device 1 becomes able to utilize the personal computer 5 that is the connected electronic device under user-specific environmental settings.

Furthermore, when a fixed time elapses, even if the fingerprint authentication device 1 is still inserted in the personal computer 5, its flow of electricity is interrupted and it switches off (procedure ST5). Therefore even if it is left inserted in the personal computer 5, the danger of the fingerprint authentication device 1's data being stolen from the personal computer 5 side by a program or something can be prevented. Also, it is possible to reduce power consumption.

INDUSTRIAL APPLICABILITY

As described above, in the present invention's external electronic device the operating unit is rotatably attached to the electronic device main body to which a connection terminal is attached. Therefore, when connected to a personal computer or a portable telephone which is to be connected the operating unit can be rotated and the operating unit can be rotates to an orientation where it is easy to use. Therefore the operating unit can always be oriented in a direction that is easy to use, regardless of the position or orientation, etc. of the socket of the external electronic device vis-à-vis the electronic device to be connected to.